The High Cost of Congestion in Canadian Cities

Urban Transportation Task Force

Council of Ministers Responsible for Transportation and Highway Safety

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Introduction

Traffic congestion is a growing problem in Canada. It is becoming acute in our largest cities, which are seeing record commute times that compare poorly with equivalent-sized cities in other countries. It is a growing problem in medium-sized cities.

Congestion reduces Canadians' quality of life and also has environmental costs. The waste of energy in gridlocked traffic and the production of greenhouse gases and other pollutants are harmful to the Canadian environment. Perhaps most importantly, congestion has substantial economic costs. Decisions on investments and jobs hinge on the quality of transportation infrastructure and the free flow of goods and people in and through our cities. Congestion increases current costs and discourages future investments.

The effects of congestion are obvious, but its causes are complex. Fundamentally, congestion is the result of the overuse of an under-priced and scarce resource, road space. At its simplest, congestion would seem to be the result of insufficient investment in road and transit capacity. But this explanation underestimates the many factors that determine why and how people travel today. Multiple influences, from changes in the economy and employment, to demographics, to land use planning and housing costs, have an impact on levels of congestion.

In an attempt to mitigate congestion, all levels of government in Canada have made significant investments in transportation infrastructure, especially in urban transit, over the last few years (see the 2010 Task Force report, *Recent Developments in Transit in Canadian Cities*). But greater investment has not led directly to a reduction in congestion.

Congestion is a problem that can be better addressed. There are many examples from Canada and around the world on how to try to mitigate it. It is important to better understand the causes of congestion, both on the supply side (the amount

of transportation infrastructure available), and the demand side (what prompts travellers to use that infrastructure). This report will attempt to understand the extent of congestion in Canada today in terms of its economic, social, and environmental costs, and its key causes. The report will also examine policy tools and innovations that could be used to reduce the impact of congestion.

Integrated transportation infrastructure that balances convenience, sustainability, and reasonable cost is a priority that is shared by all levels of government in Canada, as well as the business community. The provinces, working together with the federal government, have made huge strides in recent years investing in transportation. But investment in transportation infrastructure may not be the whole answer. This report tries to examine congestion, its causes, and its solutions in a wider context.

Structure of this report

This report will be divided into four chapters, following this introduction. The first chapter will look at the extent of congestion in Canada, using a study prepared by Transport Canada in 2006 and updated in 2009, as well as other available data. Chapter Two will explore how the improvement and expansion of urban transit can mitigate congestion. Examples of jurisdictions that have made significant investments in transit, and the impact it has had, will be explored. Chapter Three will analyze some of the policy initiatives that, in conjunction with the expansion of transit services, can help alleviate congestion. Research and case studies from Canada and international jurisdictions will be looked at for their impact and applicability in the Canadian context. Finally, Chapter Four will summarize the research and consider options that could make a real impact on congestion. The report concludes with a series of recommendations for action by authorities in Canada.

Chapter 1 – The Costs of Congestion in Canada

For any commuter in urban Canada, the anecdotal evidence of congestion is readily apparent. Sitting in gridlock is an everyday experience for many Canadians, especially those living in our largest cities. The costs of congestion come in many forms: some, such as lost time and wasted gas, accrue directly to drivers.

Other costs affect society at large: lost time, higher costs of production, lower productivity, and wasted gas impact the economy as a whole, and the increased pollution and greenhouse gas emissions that result from growing congestion affect everyone. These external costs of congestion are not directly borne by drivers.

There is a misperception among drivers of the costs of driving because one pays only the direct costs, and not the social or external costs, of driving. Quantifying these costs can assist policy-makers in determining strategies and tools to manage and reduce congestion.

There have been various attempts to measure and quantify the costs of congestion in Canada in recent years. A PricewaterhouseCoopers report, *Cities of Opportunity* (2011),[1] ranked 26 world cities based on 66 performance measures related to intellectual capital, technology, infrastructure, sustainability, business climate, cost of living, and liveability. Toronto, the only Canadian city considered in the study, ranked number 2 out of 26, second only to New York City. While Toronto scored strongly in all categories, its worst grades were under the transport and infrastructure measures, specifically on commute times and the cost of public transit.

The Economist Intelligence Unit in its 2011 liveability survey of international cities recently showed Vancouver moving out of the number one spot, a position it had

[1] PricewaterhouseCoopers, *Cities of Opportunity* (2011). **http://www.pwc.com/us/en/cities-of-opportunity/2011/pdfdownload.jhtml**

held since 2002[2]. The report stated that the main cause of the lower ranking was rising traffic congestion in the Vancouver region.

A Toronto Board of Trade study, *Scorecard on Prosperity* (2011)[3] benchmarked five Canadian cities (Toronto, Montreal, Vancouver, Calgary, and Halifax) against 18 major urban centres around the world. All of the Canadian cities scored poorly on transportation.

Other studies give similar results. Metrolinx, the provincial agency responsible for planning transit in the Greater Toronto and Hamilton Area, analyzed congestion in its 2008 regional transportation plan[4]. Through a measure known as the Travel Time Index[5] (a comparison of peak period travel time versus free-flow travel time), the Greater Toronto and Hamilton Area scored a ratio of 1.63, i.e. the average travel time is 63% longer in peak periods than under free-flow conditions.

The studies cited above focus on the economic and social costs of congestion, primarily the loss of time and the ensuing costs to individuals, business, and society at large. There is also a strong tie-in between congestion and environmental sustainability. Congestion has costs in terms of wasted fuel and additional pollution and greenhouse gas emissions.

In 2006, Transport Canada undertook a study[6] to quantify at least some of the direct *and* social costs of congestion in Canada's largest urban centres. The cities included were Vancouver, Calgary, Edmonton, Winnipeg, Hamilton,

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[2] *The Economist*, 8/30/2011, **http://www.economist.com/blogs/gulliver/2011/08/liveability-ranking**

[3] Toronto Board of Trade, *Scorecard on Prosperity (2011)*. **http://bot.com/Content/NavigationMenu/Policy/Scorecard/Scorecard_2011_Final.pdf**

[4] Metrolinx and HDR Corp., *Costs of Road Congestion on the Greater Toronto and Hamilton Area: Impact and Cost Benefit Analysis of the Metrolinx Draft Regional Transportation Plan (2008).* **http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP_08-015_Cost_of_Congestion_report_1128081.pdf**

[5] Time Travel Index is one of a wide range of congestion or mobility indicators that are used by various transportation authorities and departments.

[6] Transport Canada, *The Cost of Urban Congestion (2006).*

Toronto, Ottawa, Montreal, and Quebec City. The study was updated in 2009 to reflect newer data and reflect more current costs. The study broke the costs down into three categories: costs due to lost time of drivers, costs due to wasted fuel, and costs of emissions of greenhouse gases over what they otherwise would be under free-flow conditions.

The Transport Canada study used five measures to derive the economic, social, and environmental cost of congestion in each city:

- Duration of the peak period, i.e. the length of "rush hour" in each city;
- Percentage of work *versus* non-work trips;
- Values of time by work/non-work purposes;
- Unit fuel price; and
- Unit greenhouse gas (GHG) mitigation cost.

The costs of congestion were calculated by estimating the additional time that drivers took to complete their journeys under three thresholds of congestion: 50%, 60%, and 70% of free-flow speeds. In other words, the 70% threshold would consider movement at less than 70% of free-flow speeds as congestion. For example, on a freeway with a 100 km/h speed free flow speed, traffic flow below 70 km/h would be considered congested.

The five measures for each city were quantified and produced results that established:

- Annual amount of travel delay, measured in vehicle hours of travel;
- Annual wasted fuel volumes;
- Annual GHG emission volumes.

The results were assigned a monetary cost based on market values, or close proxies. The first indicator, lost time, is a loss to the economy, but also a social loss in terms of time not available for individuals to use for other purposes. The second indicator, wasted fuel, has both an economic cost and an environmental

cost. The final indicator, carbon emissions into the atmosphere, has consequences for the economy now and for the environment in the years ahead.

Table 1-1: Annual Congestion Costs (in $ Millions) in Canadian Cities (2006)

City	50% Congestion Threshold	60% Congestion Threshold	70% Congestion Threshold
Vancouver	$518 M	$652 M	$755 M
Edmonton	$85	$103	$120
Calgary	$149	$171	$180
Winnipeg	$73	$100	$125
Hamilton	$13	$24	$37
Toronto	$1,298	$1,672	$2,014
Ottawa-Gatineau	$220	$304	$380
Montreal	$697	$811	$910
Quebec	$63	$89	$118
Total	$3,116 M	$3,927 M	$4,640 M

Source: Transport Canada

The results showed a range of congestion costs from $3.1 billion nationally, under the 50% threshold, to $3.9 billion under the 60% threshold, and $4.6 billion under the 70% threshold. It is also noteworthy that these national costs occurred disproportionately in the three biggest cities. The Greater Toronto Area accounted for 42.5% of total congestion in the country, with Montreal and Vancouver accounting for 20.6% and 16.6%, respectively. In total, the largest three urban regions in Canada account for almost 80% of the total costs of urban congestion.

There were certain caveats to the Transport Canada study, notably that it did not consider the transportation of goods.

Other Congestion Data in Canada

Other studies have confirmed the high cost of congestion to Canada's economy, both to commuters and movers of freight. Below is a summary of some of the research undertaken in different Canadian jurisdictions.

Toronto

Metrolinx, the provincial transit agency in Ontario, conducted a study[7] of the costs of congestion in 2008. This study calculated costs based on the difference between an "optimal speed" and actual speeds during morning and evening rush hours. The study measured more than the cost to individual commuters because it included the cost of other people's time, wasted fuel, greenhouse gas emissions, and accidents. Metrolinx determined that the social and economic costs of congestion in the Greater Toronto and Hamilton Area were approximately $3.3 billion per year.

The Metrolinx study also looked at the business-related costs of congestion, including freight movement, adverse effects on the labour market, and sub-optimal allocation of resources. These costs were estimated to be $2.7 billion per year in terms of reduced GDP. Together, the study concludes that congestion is costing the Greater Toronto and Hamilton Area, directly to consumers and indirectly across the regional economy as a whole, $6 billion annually. According to Metrolinx, Toronto's costs, in per capita terms, are higher than those in either New York City or Chicago, and are expected to keep growing.

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[7] Metrolinx and HDR Corp., *Costs of Road Congestion on the Greater Toronto and Hamilton Area: Impact and Cost Benefit Analysis of the Metrolinx Draft Regional Transportation Plan (2008).* **http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP_08-015_Cost_of_Congestion_report_1128081.pdf**

Montreal

The Ministry of Transportation of Quebec (MTQ) has undertaken a number of studies on the costs of congestion. The most recent study[8] for the Montreal region was completed in 2003. It describes the "socio-economic costs" of congestion, i.e. the costs borne across society from congestion.

The study defines congestion as speeds below 60% of the free flow speed on autoroutes and major roads. The costs are measured across five outputs: time, vehicle wear, fuel, pollution, and greenhouse gas emissions. The costs, measured in this way, totalled $1.4 billion in 2003 dollars.

In addition to rising costs, the Montreal study showed other aspects of congestion. The amount of congestion rose by about 50% between 1998 and 2003. The total socio-economic costs of congestion rose by 62% in the same five-year period, but the actual increase in travel was only 8%. This data suggests that even small increases in traffic on roads that are already heavily congested will result in disproportionately large increases in the amount and costs of congestion.

Other Studies

Another study completed by the University of Toronto Department of Economics in 2009 looked at US data and found that there are limitations to addressing road congestion in urban areas by building more roads[9]. The authors describe a "Fundamental Rule of Congestion": vehicle-kilometres travelled increase at almost the exact rate that new highway infrastructure is added. New road infrastructure attracts more commuters, more business use, and more development and population growth, and the report found that new highways become congested as soon as they are built.

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[8] Quebec Ministry of Transportation and ADEC Consultants, *Cost Assessment of Traffic Congestion in the Montreal Area under 2003 Reference Conditions*

[9] National Bureau of Economic Research, *The Fundamental Law of Road Congestion: Evidence from US Cities (2009)*, Gilles Duranton, Matthew Turner, http://www.nber.org/papers/w15376

The U of T study found that congestion results from a disconnection between the costs of travel as perceived by the individual driver and the true costs that are borne by the economy and society at large. Individual drivers do not see the social costs of congestion. Most major highways in Canada are free at the point of use. They are built and maintained from general revenues, including indirect taxes on fuel. The individual driver does not perceive the true cost of the road infrastructure he or she uses.

Quantifying the costs of congestion in terms of lost time and money can be a first step in creating awareness among drivers of the true costs of congestion. Evidence suggests that developing price-based tools aimed at creating incentives to change driver behaviour and enhancing other modes of travel, such as urban transit, can cut congestion.

International Studies

Other jurisdictions have carried out studies on the costs of congestion. In the United States, the Federal Highway Administration (FHWA) measures the costs of urban congestion annually to the U.S. economy. The most recent statistics for 2009 show the annual cost of congestion in the U.S. at $115 billion. In a report describing the period from 1982 to 2003, FHWA states that “highway congestion has increased in extent, duration and intensity.” They further state that congestion impacts two-thirds of all travel (up from one-third in 1982) and is now increasing in small cities and rural areas at a faster rate than in large urban centres.

The FHWA report also notes that highway expansion has not reduced congestion in large urban areas. The report concludes that new strategies are needed to address the state of congestion, including better travel demand management, more transit investment, and congestion pricing of roads.

Chapter 2 – The Role of Transit in Alleviating Congestion

Congestion is caused mainly by commuters, most often in single-occupant vehicles. Other travel for business, pleasure, and goods movement form significant uses of public highways, but it is peak period travel by commuters to and from work that is responsible for the bulk of congestion.

It is well-understood that transit can reduce gridlock because transit vehicles can carry far more commuters in a smaller amount of road space. But congestion also affects the speed of surface-based transit vehicles, such as buses and streetcars that get caught in heavy traffic. Montreal and Toronto operate underground subway lines and commuter rail systems, and Vancouver's SkyTrain and Calgary's C-train run on their own right-of-way. But the majority of transit use in Canada is on surface vehicles, mainly buses that run in mixed traffic. Since the peak demand for transit services coincides with the peak demand by private commuters, the buses and streetcars are typically slowed to a crawl, along with everyone else.

Evidence from Canada and other jurisdictions shows that improving the quality and time-competitiveness of public transit will attract new riders and reduce congestion on the roads. The 2010 report, *Recent Developments in Transit in Canadian Cities*[10], shows that increased investment in transit by all levels of government has been accompanied by growth in transit ridership (well in excess of population growth). This has even been the case in an economic slowdown, when transit ridership usually falls. The high cost of gas is also forcing some commuters onto transit.

[10] Urban Transit Task Force, *Recent Developments in Transit in Canadian Cities (2010)*

Transit also reduces environmental impacts. In Ontario, every one per cent increase in the share of transit versus travel by car reduces the emission of greenhouse gases by about 25,000 tonnes a year.[11]

The Canadian Urban Transit Association (CUTA) reports[12] that transit ridership numbers reached a new milestone in 2010. Ridership grew by 4.1% nationally over the previous year. This represents an all-time record of 1.9 billion trips taken, an increase of 75 million riders over 2009. The increases were spread across the country in communities large and small.

The attractiveness of transit is related to its speed and convenience. Currently, with the advanced state of congestion, transit often fails to be a faster option. Statistics Canada reported in a 2010 study that the average commute time to work for drivers in Canada is 24 minutes. The average commute time to work for transit users is 44 minutes. The total daily commute time for both drivers and transit users is at least twice the length of the "to work" times cited here.

Travel in Canada's three largest cities is longer than the national average time. In Toronto, the round trip daily commute time is 81 minutes, in Montreal 76 minutes, and in Vancouver 74 minutes.

For transit to be an effective tool to reduce congestion, it must be able to bypass the road congestion and offer a faster option for commuters.

There are numerous examples of expanded transit attracting new riders and reducing congestion. Vancouver's Canada Line, which opened in 2009, connects downtown Vancouver with Richmond and the Vancouver airport and has exceeded all expectations on initial ridership. The line is attracting over 116,000 riders per weekday, a level that had not been projected until 2013,[13] and

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[11] Ontario Ministry of Infrastructure, *Building Together (2011),* **http://www.moi.gov.on.ca/en/infrastructure/building_together/section_two.asp#A**

[12] http://www.newswire.ca/en/releases/archive/July2011/25/c7098.html

[13] TransLink, **http://www.TransLink.ca/en/About-TransLink/Media/2010/August/Some-Canada-Line-passengers-arriving-three-years-early-for-their-trips.aspx**

TransLink has announced an increase in service along the line. The Canada Line is an example of a new transit line that connects important ridership-generating nodes and runs along a corridor for which there is no equivalent higher order road/freeway (Highway 99/Granville Ave is a surface street). The line can offer higher speeds into the downtown corridor and out to the airport at peak periods than travel by car.

In York Region, north of Toronto, a new bus service called Viva provides priority for transit vehicles along the congested Highway 7 corridor. It has been successful at attracting new ridership in a suburban setting.

In Quebec City, the Métrobus is a system of high-frequency buses of greater capacity that operate primarily on designated bus lanes and have priority at traffic lights. The Métrobus has a distinct look and features heated waiting areas and park-and-ride centres. The service has been a success. The Métrobus 802 added in August 2008 has triggered a 23% increase in ridership compared to the former route.

The Société de transport de Montréal implemented in March 2010 a new bus service with limited stops that operates 24/7, 365 days of the year. The 747 Express bus route, which uses some bus-only lanes, links the downtown area to Montréal-Trudeau Airport in 20 to 30 minutes, compared to the 45 minutes this trip would take by car. In addition to serving travellers, this new service also targets the 25,000 airport workers who travel to the airport daily. One year after this service began, the 747 route welcomed its one-millionth customer.

The examples cited above highlight the importance of new investments in transit which can provide a more reliable and expedited service over the congested road network and attract new riders out of their cars.

Experience shows that transit can be made more attractive by a number of transit ridership strategies, including:

- Improving system service and operations (multiple transit service types, scheduling, reduced travel time);
- Planning and performance monitoring (use of new technologies, data collection);
- Providing passengers with tools for trip planning and navigation (way finding, real-time trip planning, "next vehicle" information);
- Providing passenger accommodation and service (universal design for accessibility, access for cyclists, amenities, safety) and ridership strategies (fare strategies, promotion and education, transportation demand management).

Investments in these types of service enhancements do not have to involve capital-intensive projects, but can go a long way to making the transit user's experience better and achieve the goal of attracting more riders.

Transit (particularly rail-based transit) can serve a further function--- to stimulate transit-supportive development where residents need to own fewer cars and drive less. Municipalities in Canada are increasingly aligning their planning and zoning functions with transportation planning policies. Transit can help "intensify" urban areas with higher population densities (compact mixed-use, walkable areas) that make more efficient use of existing infrastructure. "Transit-supportive development" makes use of the ability of transit to move larger numbers of people in much smaller spaces than that required by roads. Transit-supportive development increases density and often property values. Without the need to accommodate one or more vehicles per household, development can be more compact, travel distances are shortened, and other modes of travel, such as walking and cycling, become more viable.

One such example is the City of Calgary, which adopted a new development plan and transportation plan in 2009[14] that "focuses on intensifying and diversifying urban activities around transit stations and premium transit routes." To this end, Calgary is expanding its light rail transit system, adding to the existing 45

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[14] The City of Calgary, *Guide to the Municipal Development Plan and the Calgary Transportation Plan (2010)*, **http://www.calgary.ca/docgallery/BU/planning/pdf/municipal_development_plan/guide_to_mdp_ctp.pdf**

kilometres on two lines, and developing plans to accommodate 30% of all new growth within the existing urban area, primarily along existing transit routes.

The City of Toronto is also using transit expansion to accommodate population growth. The initiative to redevelop Toronto's waterfront will add new transit services and tens of thousands of new residences in formerly derelict industrial lands near the main employment centre of downtown. It will be possible for people to live in new communities and not burden the existing road system or require the building of major new roads.

At the regional level, the Ontario government has recognized the link between sustainable planning and transit. The *Places to Grow Act* (2005) identifies a planning process for the Greater Toronto and Hamilton Area that will limit urban sprawl, integrate regional planning and transportation, and protect a large greenbelt around the urban region. Transit-supportive guidelines have also been developed for municipalities and transit agencies. The creation of Metrolinx supports these initiatives. Metrolinx has developed a 25-year, $50 billion regional transportation plan to create an integrated, intelligent transportation system that focuses on transit and supports sustainable development across the region. Ontario has supported this plan by committing $11.5 billion to implement a series of transit projects in the Greater Toronto and Hamilton Areas.

In 2008 the City of Montreal adopted a transportation plan that focuses on joint transportation and land use planning. The plan includes projects to develop and improve transit, cycling, and road networks, grouped together in 21 sites that will be constructed over the next decade. These projects aim to improve the quality of the city's environment and to promote sustainable economic development. In 2011 the City of Laval also adopted a sustainable mobility plan in which public transit plays a central role in land use planning, and in densification in particular.

In the same vein, Quebec City has approved a sustainable mobility plan that is based on the implementation of a streetcar system that runs on a route almost 30

kilometres long. This plan promotes urban densification and aims to structure, consolidate, and develop the urban area through public transit.

The benefits of transit in addressing congestion are twofold: well-planned transit in existing urban corridors can take cars off the road by offering competitive service in terms of time and cost. New transit may also reduce congestion by making denser, less car-dependent urban built form possible, and give people the opportunity to live and work in ways that do not require long, car-based trips. Integrated planning allows cities to fully leverage future investments in transit expansion to build a more compact, less car-dependent and congested city of tomorrow. Current planning is often built on good transit planning in the past. Cities like Toronto and Calgary are benefiting from transit investment made decades ago that have encouraged greater density along transit routes.

As described in the 2010 report*, Recent Developments in Transit in Canadian Cities*, significant progress has been made in investing in urban transit systems in recent years. Major investments in transit by municipalities and some provinces, supported by the federal government, have allowed many projects to move forward across the country. The benefits of these investments in terms of reducing urban congestion and allowing for more sustainable development of Canadian cities are becoming evident. Continued investments in transit, tailored to the needs of each jurisdiction, can build on current success and enhance the role of transit to combat congestion where it is most acute. Innovative financing approaches and effective transit governance can also strengthen transit's role in mitigating congestion.

Innovative Financing

If investments in transit can be made in innovative ways, the outcomes can help alleviate congestion. Transportation infrastructure as physical capital clearly represents a benefit to the economy in terms of enhanced productivity and quality of life. New transit infrastructure is a solid investment.

Many countries around the world make use of dedicated taxes for productivity-enhancing infrastructure. In the U.S., the federal gas tax is set aside from general revenue and goes back to states to finance roads and transit. France paid for the capital costs of its commuter rail system in Paris and the TGV high speed train network with a dedicated tax on business. The French autoroute system, on the other hand, is financed directly with tolls and operated by private companies under concession agreements. A number of jurisdictions in Canada have also outsourced transit service delivery to the private sector, resulting in cost savings which in turn can be dedicated to enhance transit. Each responsible authority can determine how to raise the revenue to finance transit based on the costs and benefits provided.

New sources of funds for transit investment are also available. Innovative procurement and financing tools such as public-private partnerships (PPP) place projects on more commercial terms, giving the private sector partner an ongoing role in the successful operation and maintenance of the asset, and requiring the private sector to obtain its own financing. Over the entire lifecycle of a public transit capital investment, a public-private partnership can provide greater value-for-money for public funds, resulting in more efficient use of scarce infrastructure dollars. This form of risk-sharing between public and private partners places each project under greater scrutiny and mitigates the risk of diverting resources to projects of lower merit.

Another tool to assist in the financing of transit and other projects is the state infrastructure bank. These institutions provide low-interest loans and other credit services that give transportation authorities the capacity to increase the efficiency of their transportation investments, leverage resources from other levels of government, and attract private investment to transportation infrastructure projects. Several U.S. states make use of state infrastructure banks. In the European Union, the European Investment Bank provides loans to member states for infrastructure projects.

Governance

Dedicated revenues and alternative financing and procurement alone are not sufficient to ensure that transportation infrastructure will get built in a timely and cost-effective manner. Governance is also a key piece of the puzzle. In Canada's larger cities, many different government entities are responsible for building and operating transit. There has been a trend toward consolidating these functions in one agency at arm's length from government, but still accountable through the enabling legislation and board governance structure. TransLink, the agency responsible for financing, building, and operating transit across the Greater Vancouver Regional District, is one such example. Metrolinx in the Toronto and Hamilton area is another. More effective governance of transit can stimulate transit expansion and mitigate congestion.

Chapter 3 – Other Options for Alleviating Congestion

Investments in transit can mitigate congestion in urban areas. But there are additional strategies, including technological innovation, active traffic and travel demand management, and congestion pricing for cars that can also help to reduce congestion.

Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems collect, process, and disseminate information to users across transportation networks in order to improve efficiency and safety. ITS takes into consideration the dynamic interaction of all components of a transportation system: passenger, driver, vehicle, and infrastructure. There are multiple applications for both roads and transit. In the case of transit, it can include transit information systems, such as real time schedule information and integrated ticketing systems. On highways, commonly used examples are traveller information systems, such as traffic cameras and signage to provide information on traffic conditions. ITS can also be used for road pricing schemes such as congestion charges or tolls. The use of ITS to actively manage traffic incidents can also reduce congestion.

Travel Demand Management

Travel demand management is another effective means to reduce the demand for travel at peak periods, and can include such tools as:

- car-pool programs;
- ramp metering on highways;
- telecommuting programs;
- subsidized transit passes;
- encouragement of walking and cycling;
- parking policies such as creating park-and-rides, limiting downtown parking, and making downtown parking more expensive.

Congestion Pricing

Congestion or road pricing is a contentious policy because it raises the cost of travelling during congested periods. It has garnered attention in recent years because of high-profile implementation in places like London, England, and Stockholm, Sweden. It has proved to be an effective tool to reduce the heavy congestion that has become the norm in large urban areas. We use the term "congestion pricing" to denote the focus on alleviating congestion, as opposed to the more general term of "road pricing," which may be used for different objectives such as to finance the infrastructure itself.

Congestion pricing is a form of road pricing which uses economic incentives to reduce congestion through charging a usage fee on some or all lanes of a road. It can be implemented in a variety of ways, depending on the objective of the policy. The U.S. Federal Highway Administration describes the following categories of road pricing measures and their effectiveness in mitigating congestion:

Table 4-1 Types of Road Pricing

Type of Road Pricing	Benefits	Weaknesses
Variably priced lanes e.g. "HOT" lanes; Express toll lanes	• Easily integrated into existing corridors • Preserves free lanes	• Appears to not have a great impact on overall congestion
Variable tolls on highways	• Tolls adjusted over time to reflect levels of congestion	• Peak period pricing may divert traffic to other routes, simply moving congestion
Zone-based or cordon pricing	• Means to target specific area with very high congestion • Used successfully in London and Stockholm • May finance cost of improved transit service in zone	• May encourage businesses to invest outside zone • Requires significant investment in new transit capacity before plan is implemented

Area-wide pricing	• All public roads in a given jurisdiction are subject to pricing • No leakage of congestion to non- tolled routes • Potential of replacing gas taxes with a more direct road usage based fee • GPS technology makes implementation viable	• Public appetite • Regional equity (fairness of pricing remote/rural roads)

Source: US Federal Highway Administration

To date in Canada there has not been a congestion pricing program with the specific purpose of reducing congestion. Several urban road projects constructed in recent years, however, have been developed with tolls to help finance the project and free government resources to invest in transit projects. The new A-25 Autoroute connecting Montreal and its suburb of Laval is an example of a new urban freeway connection that has a toll. It opened three years after an extension of the Montreal Métro (subway) into Laval which increased Métro use by Laval residents by 70%, bringing overall public transit use (bus, métro and train) up by over 30%, and reducing reliance on new roads.

In the U.S., there has been long experience with toll roads. Some states have implemented pricing schemes with the specific objective of reducing congestion. Two road pricing schemes have been successfully implemented in California.[15]. SR 91 Express Toll Lanes in Orange County has two tolled lanes each way in the middle of the Riverside Freeway. The price to travel in the toll lanes varies over the course of the day to keep average speed at the free-flow level, which is often more than twice the speed of the general purpose lanes. San Diego I-15 HOT lanes employ a variable priced toll on the HOV lanes that allows single occupant vehicles to use these lanes if they are willing to pay. The revenue generated is used partially to fund improved transit on adjacent corridors.

[15] US Federal Highway Administration, *Transit and Congestion Pricing: A Primer (2009)* **http://ops.fhwa.dot.gov/publications/fhwahop09015/cp_prim7_00.htm**

In Europe, both London and Stockholm have implemented cordon-based congestion pricing for their city centres. In both cases, the initiative led to a significant drop in car travel (15-20%) and significant reduction in travel times, and, more importantly, reduced delays for transit vehicles (transit service was expanded prior to implementing the pricing scheme).

Congestion pricing does get people's attention. The aphorism that "time is money" is especially true in the highly competitive, globalized marketplace of today, with "just-in-time" delivery and instantaneous communications and transactions. The time it takes to travel around our cities, where most of the wealth and job growth is created, is increasingly unacceptable. Lost time imposes costs on businesses, but it also affects quality of life – the time available for families, community involvement, and other pursuits.

Macleans magazine in a 2011 article[16] on congestion said: "We have made travelling by car artificially cheap in terms of money, and artificially expensive in terms of time." The point is that, as a public good, transportation infrastructure has intrinsic value that can be understood when initiatives such as congestion pricing are contemplated. Those willing to pay for road space would do so because congestion is already costing them as much or more in lost time. With such a readily understandable price signal, those for whom the cost is not worthwhile will consider other alternatives such as transit.

Congestion pricing is not primarily about generating revenue, but is rather a means to monetize the time costs that already exist because of congestion. By putting a cost on time, it provides incentives for transportation users to better act in their own interests. It is an added bonus that congestion pricing can generate some revenue. In many cases these funds can be put back into the transportation system in the form of transit investments, which people will now have a greater incentive to use.

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[16] *Macleans*, 17 Jan. 2011, "Stuck in Traffic," pp. 22-27

Some argue that the cost of driving is already taxed in the form of gasoline taxes. But, as an indirect tax, gas taxes do not take account of when and where driving is done, and they have little impact on behaviour. This can be observed empirically: as the price of gasoline has doubled in the last 10 years, there has been almost no impact on levels of congestion.

New technologies that did not exist a generation ago also allow the introduction of congestion pricing options at increasingly lower cost. In the case of London and Stockholm (as well as a similar system in Singapore) access to areas that are covered by the charge are completely barrier free and rely on sensors and cameras that link to license databases. Drivers are simply mailed a bill or can arrange to pay electronically. Moreover, with increasing numbers of new vehicles fitted with GPS sensors, and the ubiquity of mobile phones, the need to have ground-based infrastructure may not be necessary in the near future. Already, GPS is being used to measure and take real time snapshots of congestion. With such information on hand, developing a dynamic system of pricing to mitigate peak period congestion may be feasible, and may not be costly.

Public acceptance remains the most significant barrier to road pricing. When governments suggest congestion pricing as a means to achieve congestion relief, experience has shown that they face an uphill battle to convince the public. A more open, public debate on the costs and solutions to congestion would benefit Canadian cities.

Chapter 4 - Conclusion and Recommendations

This paper has reviewed the state of congestion in Canadian cities and found that in many of the country's large urban areas, it has reached acute levels that are imposing significant costs on drivers, the economy, the environment, and the quality of life of Canadians. A conservative estimate of costs is $4.6 billion annually, of which almost $3.7 billion is in the Toronto, Montreal and Vancouver regions.

Evidence shows that building more roads to address congestion in Canada's largest cities is not only impractical from a cost perspective, but also ineffective: the new road space is used up as fast as it is built and congestion remains unaffected.

Addressing congestion effectively will require innovative solutions that challenge the status quo. In the large urban regions where the bulk of congestion exists, new transit that provides fast, reliable options for moving people around is a major part of the solution. Governments have invested significantly in transportation infrastructure in response to population and economic growth. But funding new transit where it is most needed will require new funding partnerships among governments.

Containing the demand for new highway infrastructure in big cities may be even more difficult and even less palatable politically. Many jurisdictions around the world are experimenting with congestion pricing as a way of using economic price signals to allocate valuable road space. Properly implemented, using pilot projects and extensive public consultation, and investing in adjacent transit, these congestion management schemes have shown great promise in reducing congestion in some cases. But there remains a significant debate when it comes to congestion pricing or tolling options, and further research will be required to determine the economic and other benefits of such policies in Canada. More candid discussion of transportation pricing options is needed.

Canada has a legacy of underinvestment in transportation infrastructure over many years. Though governments have made strides to reverse that trend in recent years, catching up with the growth in population and the economy will require investments that are orders of magnitude beyond what government will be able to deliver under the status quo. This is true in part because growth has been disproportionately centred in large urban areas, which require expensive transit investments in addition to expanded roads. New revenue tools must be examined. Dedicated transportation taxes are an option. Other tools such as government infrastructure banks and public-private partnerships are also promising.

Responsibility for transit varies widely from one province to another. In some jurisdictions, transit is identified as a municipal responsibility. In others, provincial funding for transit is part of wider transfers to municipalities, and it is for municipalities to choose whether to invest provincial funding in transit or in other municipal services. In the larger provinces, provincial governments are deeply involved in planning and funding transit. Consequently, efforts to use transit to mitigate congestion will vary across Canada.

Congestion is a problem that countries around the world are grappling with. In some ways it is a “positive problem” because it is a result of economic growth and the affluence that has allowed most citizens to afford and drive cars. Prosperity and economic growth can also provide the tools to address the problem, but this will involve a change in thinking about how we pay for transportation, especially driving cars.

RECOMMENDATIONS

To further evaluate the costs of congestion and strategies to alleviate it, this report recommends that the responsible authorities in Canada:

1. **Undertake further research to identify the causes of congestion in Canadian cities, to measure its effects on the economy, environment, and quality of life of Canadians, and to explore possible solutions for it.**

2. **Encourage public discussion of innovative solutions to congestion, including expanded transit, congestion pricing, traffic demand management, the use of new technology, dedicated taxes, and new financing tools.**

3. **Recognize the role of public transit in alleviating congestion.**